

SEISMOLOGY.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Dec. 3, 1920.]

TABLE 1.—Noninstrumental earthquake reports, October, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
1919.										
OCT. 4										
OCT. 5										
OCT. 7										
OCT. 12										
OCT. 31										
OCT. 3										
CALIFORNIA.										
	H. m.		°	'			Sec.			
	13 21	Eureka.....	40	48	124	10	3	None.....	Felt by several.....	L. B. Cooper.
	4 46	do.....	40	48	124	10	4	do.....	Some alarm.....	J. M. Jones.
	19 04½	Salinas.....	36	36	121	40	20	do.....	No damage.....	E. D. Eddy.
	19 05	Spreckles.....	36	35	121	38	4	Faint.....	Felt by many.....	S. I. Gleason.
	19 07	Los Gatos.....	37	12	121	58	3	None.....	Felt by several.....	F. H. McCullagh.
	19 07	San Jose.....	37	15	121	53	4	do.....	do.....	Maurice Connell.
	19 07	San Francisco.....	37	48	122	26	47	None.....	Doors and dishes rattled.....	Mrs. R. N. Allen.
	19 07	do.....	37	48	122	26	3	do.....	Felt by several.....	M. W. Davis.
	19 07	do.....	37	48	122	26	37	do.....	Felt by two.....	M. W. Allen.
	19 07	Warner Springs.....	33	15	116	45	6-7	Rumbling.....	Felt by many.....	J. A. Ream.
	19 07	Aguanga.....	33	30	117	00	5	do.....	do.....	A. J. Berg.
	19 07	San Diego.....	32	43	117	10	3	None.....	Felt inland also.....	H. F. Alcator.
	19 07	Hemet.....	33	45	116	45	3	do.....	Felt by many.....	C. E. McManigal.
	19 07	Calexico.....	32	41	115	30	2-3	do.....	Felt by several.....	W. S. Pratt.
	19 07	El Centro.....	32	50	115	35	2	Faint.....	do.....	J. M. Bartley.
MISSOURI.										
	14 15	Harrisonville.....	38	45	94	15	2	None.....	Felt all over town.....	J. H. Patterson.

TABLE 2.—Instrumental seismological reports, October, 1920.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.	Distance.	Remarks.
					A _m A _n		

ALABAMA. Spring Hill College, Mobile.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 8	O.....	18 50 23				1,550	N undamped; no trace on E.
	P.....	18 53 43					
	S.....	18 56 25					
	L.....	18 57 13					
	M.....	18 57 25	6		*4,000		
	F.....	17 18 00					

CALIFORNIA. Theosophical University, Point Loma.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 5				150	150		Tremors.
6				100	100		
7				200	200		
10				100	100		
12		17 51 00		300	400		Light shock.
13				300	300		Tremors.
14				100	200		
16				100	100		
17				100	150		
21				100	100		
24				100	100		
25				100	150		
29				100	100		

COLORADO. Sacred Heart College, Denver.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1	L.....	19 02					P not discernible.
	L.....	19 02					
	M.....	19 04	10-12	*3,000			
	M.....	19 05	4-6	*1,000			
	C.....	19 09					
	C.....	19 09					
	F.....	19 19					
22	L.....	21 15					P not discernible;
	M.....	21 21	10-12	*500	*500		record weak and
	F.....	22 44					disturbed

* Trace amplitude.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.	Distance.	Remarks.
					A _m A _n		

DISTRICT OF COLUMBIA. Georgetown University, Washington.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1	e.....	19 01 09					Heavy micros.
	e.....	19 01 09					
	eLT.....	19 16 42					
	F.....	19 58					
5	e.....	19 19 19					
	e.....	19 19 17					
	F.....	19 40					
7	eP.....	21 03 21					N-S component
	iS.....	21 11 13					out of order.
	eL.....	21 19 30	22				
8	eP.....	18 56 47					Do.
	S.....	17 01 41					
	eL.....	17 05 18					
	L.....	17 11 20					
	F.....	17 43					
18	iP.....	8 23 14					Do.
	iS.....	8 33 30					
	eL.....	8 48 30					
	L.....	8 59	22				
	F.....	9 50					
22	iP.....	12 19 46					Heavy micros.
	eS.....	12 28 55					
	eL.....	12 41 54					
	F.....	13					
28	L.....	8 08 30	24				Do.
	F.....	8 12					
28	eP.....	13 00 00					Sheets off at 13h.
	iP.....	12 59 55					51m., quake still
	iS.....	13 10 20					on.
	eS.....	13 10 11					
	eL.....	13 22 06	28				

DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1	P.....	18 56 06					
	S.....	19 01 06					
	eL.....	19 08 45					
	F.....	19 30 00					

TABLE 2.—Instrumental seismological reports, October, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Per.iod T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington—Con.								
1920. Oct.			H. m. s.	Sec.	μ	μ	Km.	Clock stopped; record lost.
3								
7	P.		21 03 06				5,700	
	S.		21 10 26					
	L.		21 18 20					
	F.		21 40 ..					
8	P.		16 56 24				3,400	
	S.		17 01 32					
	M.		17 07 25		*2,000	*2,000		
	F.		17 30 ca					
18	P.		8 24 09				9,100	
	S.		8 24 24					
	L.		8 52 14					
	F.		8 40 ca					
18	e.		12 33 20					
	F.		12 40 50					
18	e.		13 57 ..					
	S?		14 14 ..					
	F.		14 40 ..					
20	eL.		12 09 ..					
	F.		12 25 ..					
22	P.		12 20 05				6,700	
	S.		12 28 20					
	L.		12 39 20					
	F.		13 00 00					
27	P.		11 48 44				2,400	
	S.		11 52 44					
	F.		11 56 44					
27	P.		11 57 24					
	S.		11 01 12					
	F.		12 15 ..					
28	P.		7 31 47					
	S?		7 40 45					
	e.		8 00 00					
	F.		8 20 ..					
28	1P.		12 59 59					
	S.		13 08 48					
	eL.		13 23 ..					
	F.		13 40 ..					

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.			H. m. s.	Sec.	μ.	μ.	Km.
Oct. 1	P		18 55 34				3,000
	S		19 00 19				
	eL		19 06 06	15			
	F		20 20 ca				
3	e		5 42 30				
	eL		5 46 ..	16			
	F		6 30 ca				
5	e		19 17 25				
	eL		19 20 ..				
	F		19 40 ca				
7	P		21 03 54				5,700
	S		21 11 12				
	L		21 17 49	25			
	M		21 21 25		*4,000	*4,000	
	F		22 20 ca				
8	P		16 56 18				
	S?		17 01 18				
	L?		17 04 20				
	L?		17 06 00				
	F		18 ca				
12	eL		7 46 ..				
	L		7 50 ..	22			
	L		8 00 ..	16			
	F		8 20 ca				
18	P		8 23 38				8,600
	PR		8 28 39				
	S		8 33 29				
	L		8 49 45	20			
	L		9 02 ..	18			
	F		11 ca				
18	e		12 16 06				
	S?		12 24 22				
	F		12 50 ..				
18	e		13 03 10				
	F		14 20 ca				

* Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		
ILLINOIS. U. S. Weather Bureau, Chicago—Continued.								
1920. Oct. 20			H. m. s.	Sec.	μ	μ	Km.	
	L.....		10 54 21					
	L.....		11 06 30	16				
	F.....		11 40 ca					
22	P.....		12 20 26				7,300	
	S.....		12 29 10					
	L.....		12 42 ..	30				
	L.....		12 52 ..	16				
	F.....		14 30 ca					
24	eL.....		2 36 15					
	L.....		2 38 30	18				
	F.....		3 10 ..					
27	S?		11 55 25					
	L?		11 58 25					
	F.....		13 00 00					
28	P.....		7 33 50				6,500	
	S.....		7 41 55					
	L.....		7 52 16	25				
	L.....		7 58 ..	22				
	L.....		8 03 ..	16				
	F.....		11 ca					
28	P.....		13 01 18				8,100	
	S.....		13 10 45					
	L.....		13 25 38	30				
	L.....		14 00 00	18				
	L.....		14 09 ..	14				
	F.....		15 20 ca					

NEW YORK. Cornell University, Ithaca.

1920. Oct.			H. m. s.	Sec.	μ	μ	Km.	
7	eP _N		21 04 01	3				
	eS		21 11 18	4				
	L _m		21 18 10	27				
	F		21 33 ..					
8	e		16 57 30	4				Irregular, short period waves.
	e		17 01 22	5				
	F		17 18 ..					
18	P		8 24 05	4				
	PR ₁		8 27 19	4				
	S		8 34 15	5				
	eL		8 51 56	30				
	F		9 21 ..					
18	e		12 33 36	9				
	F		12 41 ..					
18	e		13 07 30	4				
	e		13 12 35	10				
	e		13 21 04	11				
	F		13 37 ..					
22	P		12 20 33	4				
	S		12 29 05	6				
	eL		12 41 15	14				
	F		13 14 ..					
28	eL		8 00 30	18				
	F		8 13 ..					
28	P		13 01 22	5				
	PR ₁		13 03 50	4				
	eS		13 26 30	18				
	F		13 45 ..					

VERMONT. U. S. Weather Bureau, Northfield.

1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Oct. 8	.....	e	17 06 ..	.....	.....	.....	.....
	.....	F	17 15 ..	.....	.....	.....	.....
18	.....	P	8 24 ..	.....	.....	.....	9,000	
	.....	S	8 24 10	.....	.....	.....	.....
	.....	L?	8 50 ..	.....	.....	.....	.....
	.....	F	9 15 ca	.....	.....	.....	.....
18	.....	e	13 14 ..	.....	.....	.....	.....
	.....	F	13 30 ..	.....	.....	.....	.....
22	.....			.....	.....	.....	.....	Clock stopped; record lost.
28	.....	e	13 01 50	.....	.....	.....	.....
	.....	F	13 15 ..	.....	.....	.....	.....

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _M	A _N		

CANAL ZONE. Panama Canal, Balboa Heights.

1920. Oct. 7	-----	P	H. m. s.	Sec.	μ	μ	Km.	Epicenter prob- ably in Mexico.
		S _M	20 59 06				2,494	
		S _N	21 03 04					
		S _N	21 03 10					
		M _M	21 03 42		*1,500			
		M _N	21 04 12			*900		
		F _N	21 17 00					
		F _N	21 16 15					
22	-----	P _N	12 16 26				3,460	Distance from Washington, 6,920 km. Direc- tion unknown.
		P _N	12 16 25					
		S _N	12 21 35					
		S _N	12 21 48					
		M _N	12 22 20		*500			
		M _N	12 21 53			*1,500		
		F _N	12 35 00					
		F _N	12 47 00					
28	-----	P _N	12 57 20					Very slight on EW; dist. 4,311 km. ca., dir. S.; timer not rec. on EW.
		S _N	13 03 25					
		M _N	12 59 20			*500		

CANADA. Dominion Observatory, Ottawa.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _M	A _N		
1920. Oct. 1		e	H. m. s.	Sec.	μ	μ	Km.	Micros interfere with registration of preliminary phases.
		e	19 02 25					
		F	19 11 54					
5		e	19 22 30					10
		eL7	19 23 ..					
		L	19 24 18					
		F	to 30 ..					
		F	19 50 ..					
7		O	20 55 18				5,700	Irregular waves in L phase.
		P	21 04 31					
		S	21 11 51					
		S _N	21 12 33					
		S _N	21 14 11					
		eL _M	21 19 16					
		L _M	21 22 ..	28				
		L	21 30 ..	22				
		L	21 40 ..	16				
		F	22 ca ..					
8		O?	16 50 28				(3,600)	Irregular waves in L phase.
		P	16 57 16					
		S _N	17 02 40					
		eL	17 06 25					
		F	17 50 ca					
18		O	8 11 49				8,780	L.R1 recorded sharply on de- formation instru- ment, 10:30.
		iP _V	8 23 50					
		iS _V	8 33 49					
		eL _V	8 52 24					
		L _V	8 55 ..	28				
		F _V	9 ca ..					
		HALIFAX.						
		O	8 11 52				9,100	Halifax and Ottawa together indi- cated epicenter in Kurile Ids.
		eP _N	8 24 10					
		iS _N	8 34 26					
		eL	8 52 56					
20		e _M	10 54 30					24
		eL _M	11 03 30					
		F	11 20 ..					
22		O	12 09 51				7,390	Irregular.
		iP _{NV}	12 20 46					
		iS _N	12 25 30					
		iS _{NV}	12 29 35					
		iS _N	12 30 20					
		iS _{NV}	12 31 22					
		eL	12 37 30					
		L	13 00 ..	18				
		F	13 18 ..					
24		eL _M	2 42 40					20
		F	2 50 ca					
		F						
28		e _M	(7 43 00)					20
		eL _M	7 53 08					
		L	7 56 48	16				
		L	8 02 45	16				
		L	8 19 00	12				
		F	8 50 ..					

*Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _M	A _N		
CANADA. <i>Dominion Observatory, Ottawa—Continued.</i>								
1920. Oct. 28	-----		<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	Press reports quake 900 miles from La Plata.
		O.....	12 50 11				8,080	
		P _N	13 01 36					
		PR1 _N	13 04 45					
		PR2 _N	13 06 21					
		S _N	13 11 00					
		i _N	13 11 24					
		i _N	13 12 12					
		SR1 _N	(13 16 14)					
		SR2 _N	(13 19 10)					
		eL _M ?.....	13 25 08					
		L.....	13 26 45	24				
		L.....	13 28 ..	28				
		F.....	14 30 ..					

CANADA. Dominion Meteorological Service, Toronto.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _M	A _N		
1920. Oct. 1			H. m. s.	Sec.	μ	μ	Km.	Light off 19:06 to 19:10 attending instrument; quake lost.
7		i	21 00 54					Micros render read- ings doubtful.
		S	21 09 00					
		L	21 13 42					
		L	21 17 24					Micros.
		M?	21 18 48		*600			
		eL	21 40 54					
		F						Small micros going on.
		S?	17 01 06					
		eL	17 04 30					
8		M	17 08 48					Micros.
		F	17 09 54		*400			
		F						
12		eL	7 53 54					Faint record.
		F	7 56 54		*100			
		F						
15		eL	14 54 30					Faint trace.
		F	14 57 30		*200			
		F						
18		i	8 17 36					May not be seismic.
		P	78 26 24					
		i	8 27 24					
		S	8 34 42					
		L	8 42 48					
		eL	8 58 24		*1000			
		M?	9 05 54					
		L	9 43 30					
		F	9 56 42					
		F						
18		L	13 12 54					P indistinct.
		eL	13 20 06					
		M	13 22 06		*400			
		F						
		F						
20		eL	11 07 36					P very minute; S well defined; Chill.
		M	11 10 30		*300			
		eL	11 19 18					
		eL	11 25 24					
		F	11 28 24					
22		L	12 05 42					P very minute; S well defined; Chill.
		F	12 08 48		*100			
		F						
		iS	12 29 30					
		i	12 30 06					
22		M	12 31 42		*1,200			P very minute; S well defined; Chill.
		eL	12 41 42					
		eL	12 55 24		*300			
		M2	12 59 42					
		F	13 00 06					
24		L	2 34 06					P very minute; S well defined; Chill.
		eL	2 42 12					
		M	2 43 00		*200			
		eL	2 58 24					
		F						
26		L	19 25 48					P very minute; S well defined; Chill.
		F	19 28 48		*200			
		F						
		e	7 43 48					
		eL	7 59 12					
28		M	8 01 06					P very minute; S well defined; Chill.
		eL	8 17 36		*300			
		F	8 25 30					
		F						
		e	13 00 36					
28		F	13 01 12					P very minute; S well defined; Chill.
		iS	13 11 00					
		M	13 12 06		*500		8,560	
		i	13 13 54					
		iS	13 15 54					
		iSR2	13 19 42					P very minute; S well defined; Chill.
		eL	13 25 30					
		F	14 08 06					

*Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1920—Contd.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		
CANADA. Dominion Meteorological Service, Victoria.								
1920.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 1		P.	19 10 10				1,400	Probably Alaska.
		M.	19 12 37		*1,000			
		F.	19 21 28					
5		L.	19 10 51					Pender Island re-
		M.	19 12 49		*400			ported quake a
		F.	19 17 15					12:35 p. m. Pacif.
7		P?	21 06 18				8,300?	Stand. Time.
		S.	21 15 53					
		L.	21 29 10					
		M.	21 34 05		*500			
		F.	22 35 27					
8		S?	17 07 47					
		L?	17 12 17					
		L.	17 14 29					
		M.	17 17 05		*300			
		F.	17 37 23					
12		P.	7 43 56					
		L.	7 47 23					
		M.	7 53 46		*200			
		F.	7 58 41					
15		L.	14 56 12					
		M.	14 58 40		*500			
		F.	15 07 02					
18		P.	8 15 58					
		S.	8 21 02					
		L.	8 28 25					
		M.	8 36 46		*1,000		3,170	
		F.	10 03 20					
18		P.	12 14 00					
		M.	12 15 14		*200			
		F.	12 17 27					
18		P.	12 52 20				450	Merged into ne-
		M.	12 53 19		*500			quake.
				VERTI- CAL.				
		P.	12 53 10	2			520	
		L.	12 54 26	7				
		M.	12 54 26	10		3		
		F.	13 02 00					
18		P.	13 01 12				660	
		M.	13 02 42		*1,000			
		F.	13 12 01					
				VERTI- CAL.				
		P.	13 02 00	2.5			840	
		L.	13 04 00	5				
		M.	13 04 15	7		7		
		F.	13 14 00					
20		P.	10 43 12					
		M.	11 00 25		*200			
		F.	11 33 22					
22		S or L.	12 33 00					
		eL.	12 48 10					
		M.	12 57 35		*500			
		F.	13 43 20					
23								Clock stopped.
26		P.	19 30 29					
		L.	19 31 58					
		M.	19 33 28		*200			
		F.	19 34 25					
28		L.	7 36 31					
		M.	7 44 23		*400			
		F.	8 29 38					
28		P?	13 05 06?					
		or 08 03						
		S or L.	13 12 58					Press dispatches
		eL.	13 13 08					say 900 miles
		M.	13 13 57		*500			from La Plata.
		eL.	13 20 40					
28		P.	13 31 39					
		L.	13 35 35					
		M.	13 40 01		*1,100			
		F.	15 20 50					

*Trace amplitude.

SEISMOLOGICAL DISPATCHES.

[Collected by Earthquake Station, Georgetown University, Wash-
ington, D. C.]

Clarmont-Ferrant, France, October 4.—An earth shock was felt this morning in the vicinity of Issoire, Depart-
ment of Puy-de-Dome. The tremors lasted only a few
seconds and no damage was reported.—*Associated Press.*

London, October 8.—Two violent earth tremors were
felt in Mantua, Northern Italy, at midnight Wednesday,
according to a telegram to the Rome Epoca, says a Cen-
tral News dispatch from Rome, dated Thursday. The
inhabitants fled into the streets in alarm. The message
reported some property damage had been caused.—
Associated Press.

Mexico City, October 9.—Reports received here of an
earthquake yesterday in Northwestern Vera Cruz say
there were no casualties.—*Associated Press.*

Vera Cruz, October 9.—Northwestern sections of the
State of Vera Cruz were severely shaken by an earth-
quake at 10:30 o'clock yesterday morning. The regions
of Cordoba, Jalapa, Teccele, Cosautlan and the entire
district which was visited by the earthquake disaster of
last January felt the full strength of the shock. No
casualties had been reported, but property damage was
said to be heavy.—*Associated Press.*

Manila, P. I. October 10.—A severe earthquake to-day
at Baguio, capital of Bengust, Province of Yuzon, about
150 miles north of here, damaged the observatory there,
broke water mains on the military reservation and
cracked a number of concrete walls. A landslide oc-
curred as a result of high water in the river at Baguio.
No loss of life was reported. The shock was felt slightly
in Manila.—*Associated Press.*

Toulouse, France, October 20.—Earthquake shocks
were felt yesterday in several places in the Hautes Pyren-
nese Department.—*Associated Press.*

Granada, Spain, October 23.—An earthquake shock
lasting 10 minutes was felt at 6 o'clock Friday evening
throughout the Province. Damage was done in some
villages, but it has not been ascertained as yet whether
there were any casualties.—*Associated Press.*

Redding, Calif., October 27.—Lassen Peak was in pro-
nounced eruption to-day. For more than half an hour,
beginning at 2:40 p. m., black smoke rolled out of the
northern part of the crater. To-day's eruption was the
second outpouring in less than a week. A substantial
outbreak occurred Saturday.—*Associated Press.*

Valparaiso, October 28.—Violent earthquake shocks
with a vertical movement shook the Provinces of Ata-
cama and Coquimbo, north of this city, at 8:05 o'clock
this morning, the tremors lasting 2½ minutes. The
cities of Copiapo and Valanar, in the Province of Ata-
cama, were most seriously shaken, old structures in both
towns being damaged. Reports received here state no
one was injured during the earthquake.—*Associated*
Press.

NEWSPAPER CLIPPINGS.

[By the Associated Press.]

Washington, October 22.—An earthquake shock of con-
siderable intensity was recorded by the seismograph of the
Georgetown University at 7:19 o'clock this morning, con-
tinuing for nearly an hour. It is estimated that the center
of the disturbance was 4,300 miles from Washington.

Buenos Aires, October 28.—El seismografo de la Uni-
versidad de la Plata ha registrado un fuerte terremoto a
las 8.52 minutos. Se estima que el centro del disturbio
esta situado a 1,400 kilometros de distancia.

Reports for October, 1920, have not been received from
the following stations:

ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.
ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.
HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.
KANSAS. University of Kansas, Lawrence.
MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.
MASSACHUSETTS. Harvard University, Cambridge.
MISSOURI. St. Louis University, St. Louis.
NEW YORK. Canisius College, Buffalo; Fordham University, New
York.
PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.